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W. H. T. HOLDEN

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RADIORECEIVER

Filed April 1, 1925

2 Sheets-Sheet 1

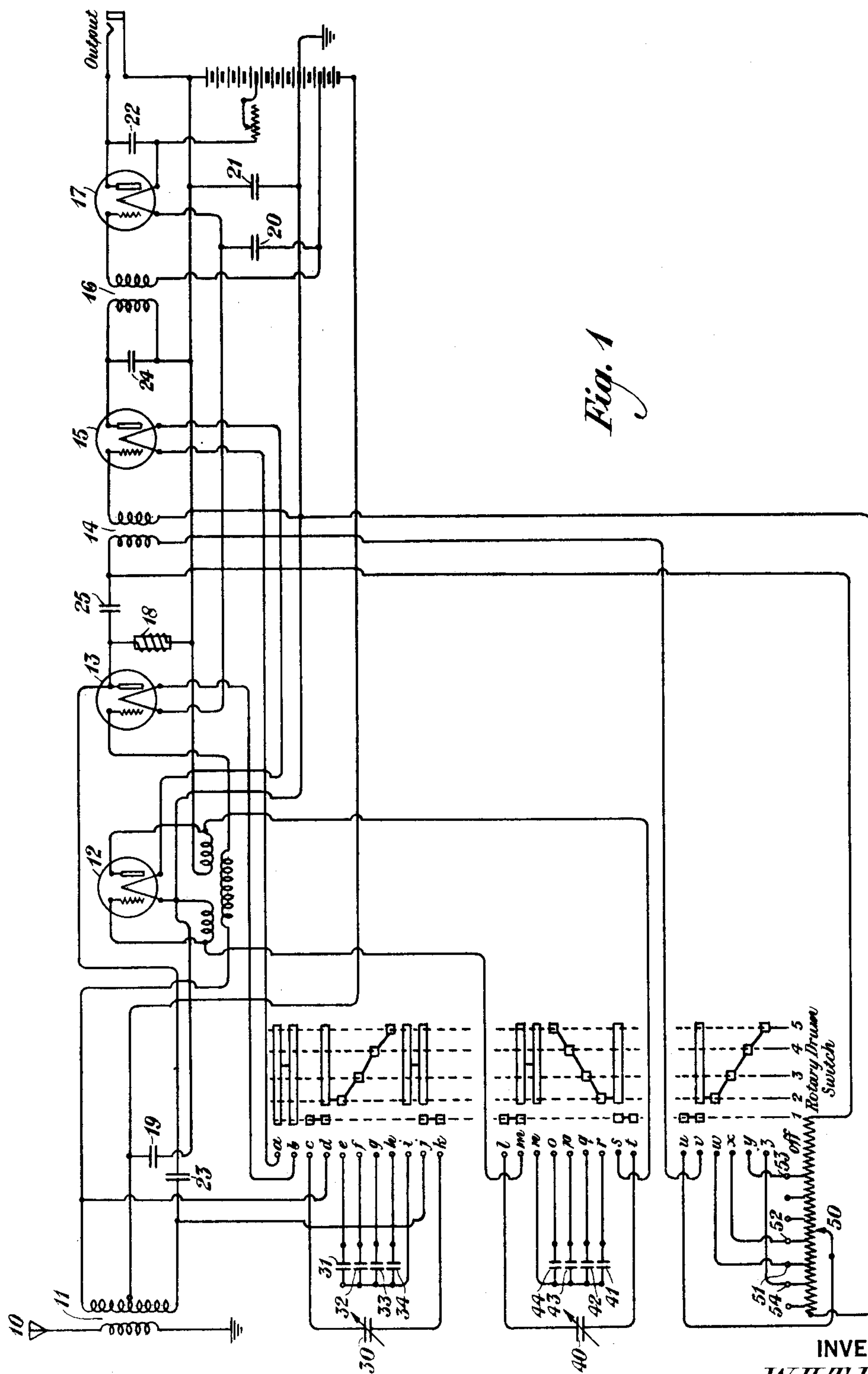


Fig. 1

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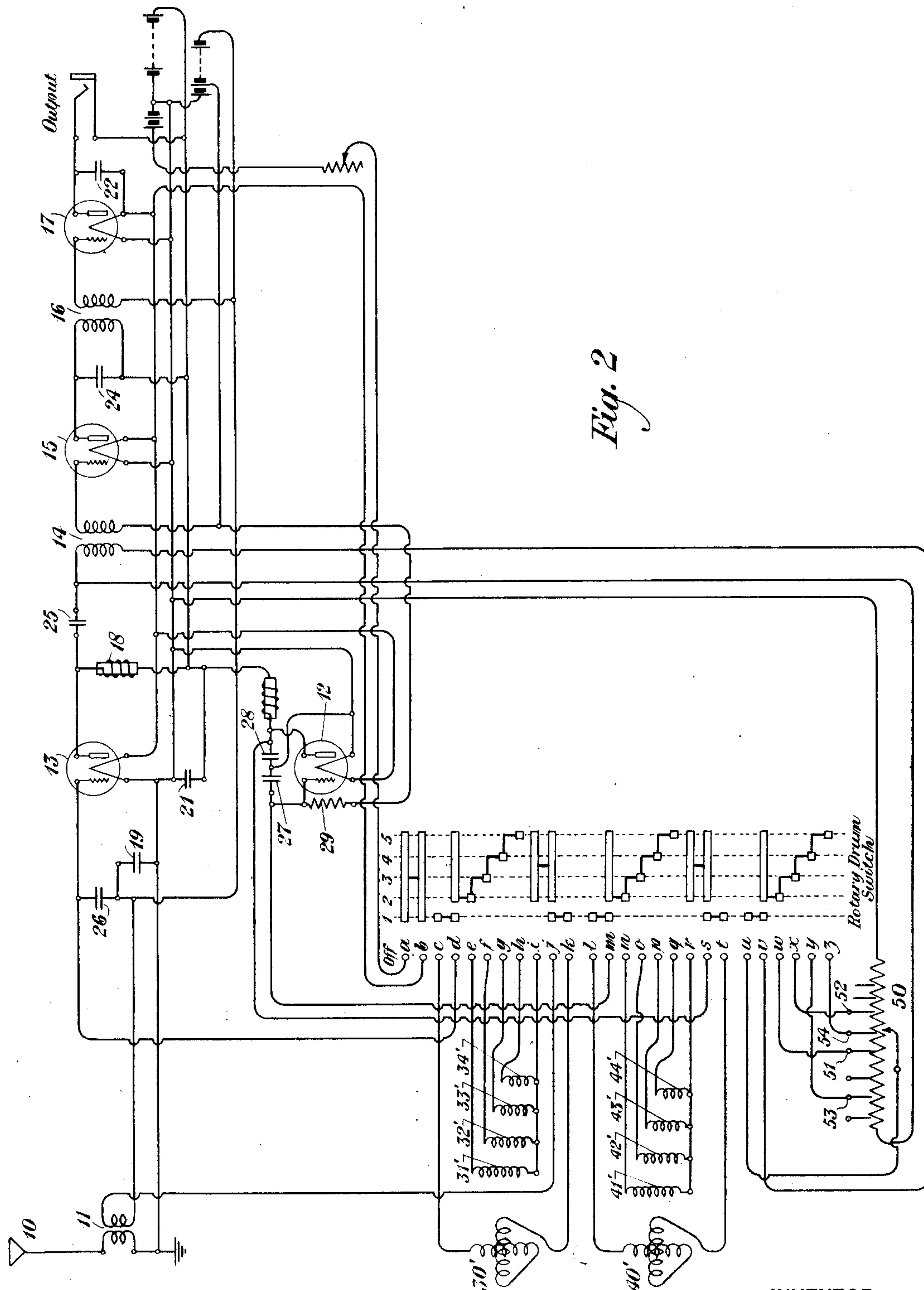


Fig. 2

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RADIORECEIVER.

Application filed April 1, 1925. Serial No. 19,935.

This invention relates to radio receivers, and consists in certain improvements applicable to the radio receiving apparatus now in general use.

5 The principal object of the invention is the provision of a radio receiver which may be arranged to receive certain stations without the necessity of operating critical tuning controls.

10 A further object of the invention is the provision of compensation, simultaneously with the tuning arrangement, for differences in field strength between the various stations received.

15 Other objects and advantages of the invention will appear in the description given below.

Applicant provides, broadly, switching and circuit arrangements whereby, first, 20 the receiver may have either variable tuning or fixed tuning to any one of a number of predetermined frequencies, and, second, the signal current in the output circuit may be maintained substantially constant, whatever may be the tuning of the circuits, by 25 adjustment of the impedance in the intermediate frequency circuit, in accordance with the known normal field strength, or strength of transmitted signal, of the various stations received, this adjustment being 30 made simultaneously with the operation of the tuning controls.

The invention will be understood from the following detailed description of applicant's improvements in two desirable forms, 35 as applied to a typical radio receiver, when the description is read with reference to the accompanying drawing, of which the two figures show diagrammatically the circuits involved, the arrangement of Figure 2 being a modification of the arrangement of 40 Fig. 1. Like characters of reference in the two figures designate corresponding parts of the system.

45 With reference to the details of Fig. 1, the radio receiving circuits shown are those of a set of the double detection type, now well known in the art, comprising the antenna 10, the antenna coupler 11, the oscillator vacuum tube 12, the modulator vacuum 50 tube 13, the intermediate frequency transformer 14, the intermediate frequency amplifier vacuum tube 15, the tuned intermediate frequency transformer 16, the detector vacuum tube 17, the intermediate fre-

quency retard coil 18, the by-pass condensers 19, 20, 21 and 22, the balancing condenser 23, the intermediate frequency amplifier tuning condenser 24, the locking condenser 25, and the batteries serving as 60 sources of energy for the various circuits of the vacuum tubes.

In the arrangement shown in Fig. 1, the variable condenser 30 and the fixed condensers 31, 32, 33 and 34 are provided as 65 tuning elements for the antenna coupler secondary circuit (or modulator input circuit), and the variable condenser 40 and the fixed condensers 41, 42, 43 and 44 serve to tune the oscillator circuit. Any suitable switch- 70 ing means may be employed. The device shown in the drawing is a rotary drum switch. The dotted lines of the drawing indicate the contacts made at each position of the switch, it being understood that each 75 switch contact point cut by a dotted line makes connection with the corresponding contact point on the left. This switch not only controls the tuning, but also opens and closes the filament circuit of the tubes. 80

In addition, the rotary drum switch serves to control the gain adjustment through contacts connected to taps of an adjustable potentiometer rheostat 50, connected as shown 85 in the drawing. This provides, in effect, a variable resistance shunt across the transformer 14. The inclusion of the adjustable potentiometer rheostat provides compensation for difference in strength of the signals normally transmitted by the various 90 stations received and produces approximately the same signal strength in the output circuit for all stations.

In the "off" position of the switch, the filament circuit is broken between the con- 95 tact points *a* and *b*; all condensers are cut out of the circuits of the antenna coupler secondary and of the oscillator; and the potentiometer rheostat is disconnected from the circuits. 100

In position "1", the filament circuit is completed by the connection between contact points *a* and *b*; the variable condenser 30 is connected across the antenna coupler secondary circuit through contact points *c* and 105 *d* and *k* and *j*; the variable condenser 40 is connected across the oscillator circuit through contact points *l* and *m* and *t* and *s*; and the potentiometer rheostat is included in the system by the connection of contact 110

points *u* and *v*. With the variable condensers 30 and 40 in the circuits, any frequency within the range covered by the set may be received—by a suitable adjustment of the 5 condensers.

In position "2", the variable condensers 30 and 40 are cut out of the antenna coupler secondary and the oscillator circuits, respectively, and the fixed condensers 31 and 41 10 are connected across the tuned circuits through contact points *d*, *e*, *i* and *j* and *m*, *n*, *r* and *s*, respectively, the capacity of these condensers being so chosen that the set is now tuned to the frequency transmitted by 15 one given station. Likewise the connection to the potentiometer rheostat through contact point *w* is to the tap 51, thus providing a resistance suitable for keeping the proper signal strength in the output circuit, this 20 resistance being determined by the strength of the signals transmitted by the station received in position "2" when that station is transmitting normally.

In position "3", the fixed condensers 32 25 and 42 are connected across the antenna coupler secondary and the oscillator circuits, respectively, through contact points *d*, *f*, *i* and *j* and *m*, *n*, *q* and *s*, and the connection of the potentiometer rheostat is through contact point *x* to the tap 52. In this case the 30 capacities of the fixed condensers and the resistance of the rheostat are chosen in accordance with the frequency transmitted by and the normal strength of transmitted signal of a second given station. 35

In position "4", the fixed condensers 33 and 43 are connected across the tuned circuits through the contact points *d*, *g*, *i* and *j* and *m*, *n*, *p* and *s*, respectively, and the 40 connection to the potentiometer rheostat is through contact point *y* to tap 53. The capacities of the fixed condensers and the position of the tap 53 are, as above, chosen for a given station to be received on this position. 45

In position "5", the fixed condensers 34 and 44 are connected across the tuned circuits through contact points *d*, *h*, *i* and *j* and *m*, *n*, *o* and *s*, respectively, and the connection to the potentiometer rheostat is 50 through contact point *z* to tap 54. Here again the capacities of the fixed condensers and the position of tap 54 are suitable for the fourth given station to be received.

Hence it is seen that, with the switch in position "1", any frequency within the range covered by the set may be received, it being necessary, of course, to adjust the variable condensers. On any one of the positions 60 "2", "3", "4" and "5" the set will be tuned for a given station, and proper adjustment will be made through the potentiometer rheostat to the signal strength of that station when it is transmitting normally.

65 In the arrangement shown in Fig. 2 of the

drawing, variometers 30' and 40' are substituted for the variable condensers 30 and 40 of Fig. 1, and the fixed inductances 31', 32', 33', and 34', and 41', 42', 43' and 44' 70 are substituted in place of the fixed condensers of Fig. 1. This modification, of course, necessitates certain other changes from the arrangement of Fig. 1: the by-pass condenser 20 and the balancing condenser 23 of Fig. 1 are omitted, and the by-pass 75 condensers 26, 27 and 28 are added, and a grid leak resistance 29 is added to the oscillator. These last named changes involve apparatus and circuit arrangements old in the art and are without the scope of the 80 claims.

The switching arrangement of Fig. 2 is substantially the same as that of Fig. 1, the tuning change being accomplished by a change of the inductance of the tuned circuits instead of a change of capacity. 85

It is understood, of course, that by adding to the number of fixed condensers (or fixed inductances) and to the number of the contacts on the switch, the set may be arranged 90 to receive any number of given stations without any adjustment after the original setting of the switch.

It is to be understood further that any suitable switching means may be employed, 95 the showing of the rotary drum switch merely serving as an illustration. Likewise, as indicated above, applicant's improvements may be applied not only to a double detection radio receiver, such as is shown in the 100 drawing, but to any radio receiving apparatus having tuned circuits.

What is claimed is:

1. In a radio receiving system including a plurality of tuned circuits and a variable 105 impedance element for controlling the gain of the system, a variable tuning element and a plurality of fixed tuning elements of different values associated with each tuned circuit, switching means for connecting 110 across the first of said tuned circuits any one of said tuning elements associated therewith and for simultaneously connecting across the second of said tuned circuits the tuning element associated therewith corresponding to said tuning element connected 115 across said first circuit whereby said system may be tuned to receive a predetermined wave length, and means controlled by said switching means for simultaneously making 120 a corresponding predetermined adjustment of said impedance element.

2. In a radio receiving system including a tuned modulator input circuit, a tuned oscillator circuit, and a variable impedance 125 element for controlling the gain of the system, a variable tuning element and a plurality of fixed tuning elements of different values associated with each of the tuned circuits, switching means for connecting 130

across the first of said tuned circuits any one of said tuning elements associated therewith and for simultaneously connecting across the second of said tuned circuits the tuning element associated therewith corresponding to said tuning element connected across said first circuit whereby said system may be tuned to receive a predetermined wave length, and means controlled by said switching means for simultaneously making a corresponding predetermined adjustment of said impedance element.

3. In a radio receiving system including a plurality of tuned circuits and a variable impedance element for controlling the gain of the system, a variable capacity and a plurality of fixed capacities of different values associated with each tuned circuit, switching means for connecting across the first of said tuned circuits any one of said fixed capacities associated therewith and for simultaneously connecting across the second of said tuned circuits the fixed capacity associated therewith corresponding to said capacity connected across said first circuit whereby said system may be tuned to receive a predetermined wave length, and means controlled by said switching means for simultaneously making a corresponding predetermined adjustment of said impedance element.

4. In a radio receiving system including a tuned modulator input circuit, a tuned oscillator circuit, and a variable impedance element for controlling the gain of the system, a variable capacity and a plurality of fixed capacities of different values associated with each of the tuned circuits, switching means for connecting across the first of said tuned circuits any one of said fixed capacities associated therewith and for simultaneously connecting across the second of said tuned circuits the fixed capacity associated therewith corresponding to said capacity connected across said first circuit whereby said system may be tuned to receive a predetermined wave length, and means controlled by said switching means for simultaneously making a corresponding predetermined adjustment of said impedance element.

5. In a radio receiving system including a plurality of tuned circuits and a potentiometer rheostat for controlling the gain of the system, a variable capacity and a plurality of fixed capacities of different values associated with each tuned circuit, switching means for connecting across the first of said tuned circuits any one of said fixed capacities associated therewith and for simultaneously connecting across the second of said tuned circuits the fixed capacity associated therewith corresponding to said capacity connected across said first circuit whereby said system may be tuned to receive a pre-

determined wave length, and means controlled by said switching means for simultaneously making a corresponding predetermined adjustment of said potentiometer rheostat.

6. In a radio receiving system including a tuned modulator input circuit, a tuned oscillator circuit, and a potentiometer rheostat for controlling the gain of the system; a variable capacity and a plurality of fixed capacities of different values associated with the modulator circuit, a variable capacity and a plurality of fixed capacities of different values associated with the oscillator circuit, switching means for connecting across the first of said tuned circuits any one of said fixed capacities associated therewith and for simultaneously connecting across the second of said tuned circuits the fixed capacity associated therewith corresponding to said capacity connected across said first circuit whereby said system may be tuned to receive a predetermined wave length, and means controlled by said switching means for simultaneously making a corresponding predetermined adjustment of said potentiometer rheostat.

7. In a radio receiving system including a tuned modulator input circuit, a tuned oscillator circuit, and a potentiometer rheostat for controlling the gain of the system; a variable capacity and a plurality of fixed capacities of different values associated with the modulator circuit; a variable capacity and a plurality of fixed capacities of correspondingly different values associated with the oscillator circuit; and switching means for simultaneously connecting across the modulator input circuit any one of the capacities associated therewith, connecting across the oscillator circuit the corresponding capacity associated therewith, and making a corresponding predetermined adjustment of the potentiometer rheostat.

8. In a radio receiving system including a plurality of tuned circuits and a variable impedance element for controlling the gain of the system, a variable tuning element and a plurality of fixed tuning elements associated with each tuned circuit, each of said fixed tuning elements being of a value suitable for tuning the receiving circuits to the frequency transmitted by a certain one of a plurality of given stations, and switching means for simultaneously connecting across each of the tuned circuits either the variable tuning element or the fixed tuning element corresponding to any one of the given stations, and making a predetermined adjustment of said impedance element suitable for the particular transmitting station.

9. In a radio receiving system including a tuned modulator input circuit, a tuned oscillator circuit, and a potentiometer rheostat for controlling the gain of the system; a

variable capacity and a plurality of fixed capacities associated with each tuned circuit, each of said fixed condensers being of a value suitable for tuning the receiving circuits to the frequency transmitted by a certain one of a plurality of given stations; and switching means for simultaneously connecting across each of the tuned circuits either the variable capacity or the fixed capacity corresponding to any one of the given stations, and making a predetermined adjustment of the potentiometer rheostat suitable for the particular transmitting station.

10. In a radio receiving system including a plurality of tuned thermionic vacuum tube circuits, a variable tuning element and a plurality of fixed tuning elements of different values associated with each of the tuned circuits, and switching means for simultaneously closing the filament circuit of the system and for connecting across the first of said tuned circuits any one of said tuned elements associated therewith and for simultaneously connecting across the second of said tuned circuits the tuning element associated therewith corresponding to said tuning element connected across said first circuit whereby said system may be tuned to receive a predetermined wave length.

11. In a radio receiving system including a plurality of tuned thermionic vacuum tube circuits and a variable impedance element for controlling the gain of the system, a variable tuning element and a plurality of fixed tuning elements of different values associated with each of the tuned circuits, and

switching means for simultaneously closing the filament circuit of the system, for connecting across the first of said tuned circuits any one of said tuning elements associated therewith and for simultaneously connecting across the second of said tuned circuits the tuning element associated therewith corresponding to said tuning element connected across said first circuit whereby said system may be tuned to receive a predetermined wave length, and for simultaneously making a corresponding predetermined adjustment of said impedance element.

12. In a radio receiving system including a plurality of tuned thermionic vacuum tube circuits and a variable impedance element for controlling the gain of the system, a variable tuning element and a plurality of fixed tuning elements associated with each tuned circuit, each of said fixed tuning elements being of a value suitable for tuning the receiving circuits to the frequency transmitted by a certain one of a plurality of given stations, and switching means for simultaneously closing the filament circuit of the system, connecting across each of the tuned circuits either the variable tuning element or the fixed tuning element corresponding to any one of the given stations, and making a predetermined adjustment of said impedance element suitable for the particular transmitting station.

In testimony whereof, I have signed my name to this specification this 27th day of March 1925.

WILLIAM H. T. HOLDEN.